UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MICHAEL J. BERMAN

Appeal 2007-1661
Application 09/553,140
Technology Center 2600

Decided: October 31, 2007

Before JOHN C. MARTIN, JOSEPH L. DIXON, and
JOHN A. JEFFERY, *Administrative Patent Judges*.

DIXON, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the Examiner's Final Rejection of claims 1-28. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE and enter a New Ground of Rejection.

BACKGROUND

Appellant's invention relates to determination of film thickness during chemical mechanical polishing. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced below.

> 1. A method of determining layer thickness of a particular area of a substrate during CMP of the substrate, the method comprising the steps of:
>
> acquiring an image of a particular area of the substrate using high speed imaging;
>
> comparing the acquired high speed image to each one of a plurality of stored image patterns; and
>
> converting the acquired high speed image into a layer thickness measurement when the acquired high speed image corresponds to one of said plurality of stored image patterns.

PRIOR ART

The prior art references of record relied upon by the Examiner in rejecting the appealed claims are:

O'Boyle	US 5,640,242	Jun. 17, 1997
Bibby, Jr.	US 6,361,646 B1	Mar. 26, 2002

REJECTIONS

Claims 1, 2, 8-9, and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Boyle.

Claims 3-7, 10-11, and 13-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Boyle in view of Bibby, Jr.

Rather than reiterate the conflicting viewpoints advanced by the Examiner and the Appellant regarding the above-noted rejection, we make reference to the Examiner's Answer (mailed Jun. 16, 2004) and the Supplemental Examiner's Answer (mailed Jan. 19, 2005) for the reasoning in support of the rejections, and to Appellant's Brief (filed Mar. 16, 2004) and Reply Brief (filed Aug. 20, 2004) for the arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to Appellant's Specification and claims, to the applied prior art references, and to the respective positions articulated by Appellant and the Examiner. As a consequence of our review, we make the determinations that follow.

35 U.S.C. § 103

For reasons stated *infra* in our new rejection under the second paragraph of Section 112, entered under the provisions of 37 C.F.R. § 41.50(b), no reasonably definite meaning can be ascribed to the term "high speed" in the claims. As the court in *In re Wilson*, 424 F.2d 1382, 1385, 165, 496 USPQ 494 (CCPA 1970) stated:

> All words in a claim must be considered in judging the patentability of that claim against the prior art. If no reasonably definite meaning can be ascribed to certain terms in the claim, the subject matter does not become obvious --the claim becomes indefinite.

Since a rejection based on prior art cannot be based on speculations and assumptions regarding the meaning of a claim, *see In re Steele*, 305 F.2d 859, 862, 134 USPQ 292, 295 (CCPA 1962), we are constrained to reverse, *pro forma*, the Examiner's rejections of claims 1-28 under 35 U.S.C.

§ 103(a). We hasten to add that our reversal is solely procedural and thus is not based upon the merits of the Section 103 rejections.

However, we offer the following observations regarding whether O'Boyle discloses "high speed" image-taking. We cannot agree with the Examiner that O'Boyle's CCD necessarily is a "high speed imaging device" (Answer 3). O'Boyle is silent as to the speed of the CCD device. That a CCD is not necessarily a "high speed" device (whatever that is) is evident from Appellant's Specification, which describes using a CCD as either a "high speed" camera (*id.* at 10:6-7) or a "conventional speed" camera (*id.* at 10, last three lines). We therefore find that a CCD (camera) *may* be used as a high speed imaging device, but it is not necessarily a high speed imaging device as maintained by the Examiner. On the other hand, we note that neither the Examiner nor Appellant has addressed whether the "high speed" limitation (whatever it means) reads on O'Boyle's use of a "video frame grabber" during the image acquisition process (e.g., col. 3, ll. 22-23).

In addition to denying that O'Boyle's image-taking is done at "high speed," Appellant questions whether that image-taking satisfies another limitation of the claims. Specifically, Appellant notes that O'Boyle's measurements are taken during a "CMP process" (Reply Br. 4) that includes, *inter alia*, polishing the wafer and rinsing the wafer (*id.*), and argues that

> claim 1 clearly recites that the image is acquired during the chemical-mechanical polishing of a substrate in a CMP [chemical mechanical polishing] Process. Taking an image of a wafer during the activity of *rinsing* the wafer in the clear water of a rinse tank during a CMP process *is not the same as* taking an image of a substrate during the activity of *polishing* the substrate with a polishing pad during a CMP process.

Reply Br. 5. Inasmuch as Appellant's Specification explains that the image acquisition (imager) unit 26 can be employed "to obtain images of the substrate during CMP operation" (Specification 9:14-15) and that "[a]lternatively, CMP operation may be periodically halted for obtaining images using the acquisition device 26" (*id.* at 9:17-19), it is not clear whether Appellant's position is (a) that image-taking must occur while the wafer is actively being polished or (b) that image-taking must occur while the wafer is in -- or in proximity to[1] -- the polishing position. In any event, we do not agree with either position.

The claim language must be given its broadest reasonable interpretation consistent with the specification and in light of any definitions given in the specification. *In re Morris*, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). Claim 1 and the other independent claims specify that image-taking occurs "during CMP of the substrate." While the term "CMP" is defined in the Specification at page 7, lines 10-11 to mean "chemical-mechanical polishing," it is not further defined to specifically refer to the act of polishing a wafer (or to the act of holding in or proximate a position in which polishing can occur). The claim language is therefore broad enough to read on O'Boyle's overall CMP process, including the acts of polishing and rinsing (during which image-taking occurs).[2] That is, the requirement of the claims that image-taking occur "during CMP of the substrate" is broad enough to read on O'Boyle's disclosed CMP process,

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[1] In one embodiment, "the wafer would be moved over the inside or the outside of the polishing pad 22 for a reading (image acquisition) by the image acquisition unit 26." Specification 9-10.

[2] We do not reach the Examiner's argument that O'Boyle alternatively discloses in situ image-taking at column 4, lines 47-50. Answer 5, para. 4.

because the thickness measurements, including image-taking, are made "*during* and independent of *CMP process operations*" (col. 2, ll. 57-60),

35 U.S.C. § 112, SECOND PARAGRAPH

Claims 1-28 are rejected under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the invention that Appellant regards as the invention. In claim 1, the language "using high speed imaging" in lines 3 and 4, "high speed image" in line 6, and "the acquired high speed image" in line 7 do not particularly point out and distinctly claim the invention because it is unclear what the metes and bounds of a "high speed image" is from Appellant's Specification. *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 USPQ 568, 574 (Fed. Cir. 1984) ("When a word of degree is used the district court must determine whether the patent's specification provides some standard for measuring said degree. The trial court must decide, that is, whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification."). Here, we find no express definitions of "high speed imaging" or of an "acquired high speed image" to differentiate those claim limitations from the prior art. Therefore, we are unable to determine the metes and bounds of each of independent claims 1, 9, 15, and 23 and their respective dependent claims. As a result, we cannot effectively apply prior art thereto.

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.50(b) (2007). 37 C.F.R. § 41.50(b) provides that "[a] new ground of rejection . . . shall not be considered final for judicial review."

37 C.F.R. § 41.50(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) *Reopen prosecution*. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
>
> (2) *Request rehearing*. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

CONCLUSIO N

To summarize, we have not sustained the rejection of claims 1-28 under 35 U.S.C. § 103(a), and we have entered a new grounds of rejection of claims 1-28 under 35 U.S.C. § 112, Second Paragraph.

REVERSED

37 C.F.R. § 41.50(b)

JEFFERY, *Administrative Patent Judge*, Dissenting:

I respectfully dissent from the majority's view that the claims fail to particularly point and distinctly claim the subject matter that Appellant regards as the invention under second paragraph of 35 U.S.C. § 112. For the reasons that follow, I find the scope of the claims reasonably ascertainable and the claims sufficiently definite under § 112.

The majority indicates that it is unable to determine the metes and bounds of the claims due to certain limitations that pertain to high speed imaging, namely the limitations calling for "using high speed imaging" and an "acquired high speed image." In reaching this conclusion, the majority notes that the terms "high speed imaging" and "acquired high speed image" were not expressly defined to differentiate these limitations from the prior art. Consequently, the majority concludes, prior art cannot be effectively applied to the claims (Majority Op. 6).

"Claims are considered indefinite when they are not amenable to construction or are insoluably ambiguous…. Thus, the definiteness of claim terms depends on whether those terms can be given any reasonable meaning." *Young v. Lumenis, Inc.*, 492 F.3d 1336, 1346 (Fed. Cir. 2007) (internal quotation marks and citations omitted). Indefiniteness requires a determination whether those skilled in the art would understand what is claimed. *Id.* This determination requires considering primarily the intrinsic evidence: the claim language, specification, and the prosecution history. *Id.*

As the majority indicates, the Specification does not define "high speed imaging." The Specification does, however, describe several embodiments of an in situ image acquisition unit 26 which are relevant to the claim limitations in question. One embodiment uses a "*high speed*"

camera 30 and a conventional light source (Specification 10:3-18; Claim 2), while other embodiments use a "*conventional speed*" camera with coherent or broad band light sources that produce either pulsed light or light of short duration (Specification 10:19 – 11:6; Claims 3-6).

The specification, however, is hardly a model of clarity regarding exactly what constitutes "high speed imaging" or what distinguishes a "high speed" camera from a "conventional speed" camera. The Specification merely states that the "high speed" camera may be any type of high speed digital or analog camera, "such as ones made by EG&G and Kodak" (Specification 10:6-8). The Specification further notes that "[t]he high speed camera is thus able to acquire or capture high resolution images of areas or portions of the substrate 14 by virtue of its high speed nature" (Specification 10:16-18).

Apart from these general statements, however, the specification provides no further details of these cameras (e.g., specific speeds, model numbers, or types). In contrast, the Specification does not refer to manufacturers in connection with the embodiments using "conventional speed" cameras, but merely states that any type of "conventional speed" camera can be used (Specification 10:21-23).

Despite the Specification's clear -- but unspecific -- distinction between "high speed" and "conventional speed" cameras, this scant description falls well short of specifically defining "high speed imaging."[3]

[3] If anything, the Specification's lack of detail in this regard raises a possible enablement issue under the first paragraph of § 112.

Accordingly, the term "high speed imaging" must be construed with the ordinary and customary meaning attributed to the term by those of ordinary skill in the art.[4]

The fundamental question, therefore, is whether such an interpretation can reasonably be done. For the reasons that follow, I find that it can.

Although one could argue that absent any further limitation in the claims or clarification in the Specification, the term "high speed" used in connection with imaging is merely a relative term that, without more, is simply broad (but definite).[5] Under this broad interpretation, virtually any image acquisition system could conceivably be considered a "high speed" system.

However, I find the term "high speed" used in connection with imaging has a specific meaning to skilled artisans and is therefore amenable to construction and not "insoluably ambiguous" so as to render the claims indefinite. In my view, skilled artisans would understand that the limitation is a term of art referring to a particular type of imaging system *with elevated frame rates* –frame rates that substantially exceed those of standard, consumer-grade devices.[6]

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[4] *See Brookhill-Wilk 1, LLC. v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1298, 67 USPQ2d 1132, 1136 (Fed. Cir. 2003) ("In the absence of an express intent to impart a novel meaning to the claim terms, the words are presumed to take on the ordinary and customary meanings attributed to them by those of ordinary skill in the art."); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312, 75 USPQ2d 1321, 1326 (Fed. Cir. 2005) (en banc).

[5] *See, e.g., In re Miller*, 441 F.2d 689, 693 (CCPA 1971) (noting that claim breadth is not to be equated with indefiniteness).

[6] However, such consumer grade devices have been adapted for high-speed imaging applications. *See* Andrew Davidhazy, *High Speed Imaging with an AGFA Consumer Grade Digital Camera*, School of Photo. Arts & Sci., Rochester Inst. of Tech., June 15, 1998, *at* http://www.rit.edu/~andpph/text-

In this regard, the published literature is replete with descriptions of high speed imaging systems. For example, high speed imaging is described as "the technique of recording an event at a *high frame rate* and playing the acquired images back at a much slower rate."[7] As this description indicates, the frame rate is a key factor in a high speed imaging system.[8]

In the 1970s, high speed imaging systems recorded at frame rates of 120 and 300 frames per second (fps). In the early 1980s, however, Kodak -- the same manufacturer referred to in Appellant's specification -- introduced a system capable of recording 2,000 fps. Around 1991, a Kodak high speed camera could record up to 4,500 fps at full resolution and up to 40,500 fps at reduced resolution.[9]

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agfa-1280-hs.html (last visited Oct. 23, 2007).

[7] Motion Engineering Co., MEC University, *102: What is High Speed Imaging?*, *at* http://www.highspeedimaging.com/university_102-what_is_high-speed_imaging.cfm (last visited Oct. 22, 2007).

[8] *See, e.g.,* Motion Engineering Co., MEC University, *Frequently Asked Questions for High-Speed Cameras, Digital High-Speed Video and High-Speed Imaging Applications*, *at* http://www.highspeedimaging.com/faq.cfm (last visited Oct. 22, 2007) ("As an example, at a rate of 500 frames per second, high-speed imaging allows you to capture nearly 17 images for every one that would be captured by standard video (30 frames per second)."); *see also* Motion Engineering Co., MEC University, *103 Why High-Speed Imaging?*, *at* http://www.highspeedimaging.com/university_103-why_high-speed_imaging.cfm (last visited Oct. 22, 2007) ("Standard camcorders can only record at 30 frames per second and, as a result, usually miss most of the action in fast-moving events. However, if we use high-speed cameras to record these events at *hundreds or even thousands of frames per second*, it is a different story.") (emphasis added).

[9] *See* Motion Engineering Co., MEC University, *101: History of High-Speed Imaging*, *at* http://www.highspeedimaging.com/university_101-high-speed_imaging_history.cfm (last visited Oct. 22, 2007).

Despite the wide range of elevated frame rates that characterize "high speed" imaging systems as noted above, I nevertheless conclude that the skilled artisan could reasonably ascertain the scope of the term in light of its standard usage in the art (i.e., systems with an elevated frame rate of at least 120 fps).

In my view, the term "high speed imaging" has a recognized meaning in the art and is therefore reasonably amenable to construction and not insoluably ambiguous. I therefore respectfully dissent from the majority's view that the claims are indefinite under the second paragraph of 35 U.S.C. § 112.

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